

PATENT APPLICATION

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of

Docket No: Q78640

Yoshihiro UETANI, et al.

Appln. No.: 10/724,882

Group Art Unit: 1794

Confirmation No.: 1657

Examiner: Anish P. DESAI

Filed: December 2, 2003

For: CROSSLINKING POLYMER-SUPPORTED POROUS FILM FOR BATTERY SEPARATOR AND
METHOD FOR PRODUCING BATTERY USING THE SAME

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

MAIL STOP APPEAL BRIEF - PATENTS

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest is Nitto Denko Corporation.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the Assignee of this application are not aware of any other appeals or interferences that will directly affect, or be affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-7 and 9-12 are pending in the application.

Claims 8 and 13 have been canceled.

Claims 10-12 are withdrawn from consideration.

Claims 1-7 and 9 are rejected.

This is an appeal from the Examiner's rejections of claims 1-7 and 9 under 35 U.S.C. § 103(a).

IV. STATUS OF AMENDMENTS

The claims were amended in an Amendment under 37 C.F.R. § 1.111 filed on October 26, 2005; an Amendment under 37 C.F.R. § 1.116 filed on January 30, 2007, entry of which was forced by filing a Request for Continued Examination on February 27, 2007; an Amendment under 37 C.F.R. § 1.111 filed on January 29, 2008; an Amendment under 37 C.F.R. § 1.114 filed on October 23, 2008; and an Amendment under 37 C.F.R. § 1.111 filed on March 30, 2009. There are no outstanding amendments to the claims or to the specification in the present application.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a crosslinking polymer-supported porous film for battery separator. *See* page 3, lines 8-12 and page 4, lines 5-8 of the specification. The crosslinking polymer-supported porous film comprises a porous film substrate; and a crosslinking polymer layer formed on the porous film substrate so as to be in contact with the porous film substrate. *See* page 4, lines 5-8. The crosslinking polymer layer consists of a crosslinking polymer having plural cation-polymerizable functional groups and being polymerizable in the presence of cation. *See* page 4, lines 5-8 and page 22, line 24 to page 23, line 7.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

An issue on appeal is the rejection of claim 1-7 and 9 under 35 U.S.C. §103(a) as allegedly being unpatentable over Yuji et al. (JP 2002-110245; hereinafter "JP '245") in view of Nakagawa et al. (US 2003/0064282).

VII. ARGUMENT

The rejection of claims 1-7 and 9 under 35 U.S.C. §103(a) as allegedly being unpatentable over Yuji et al. (JP 2002-110245; hereinafter "JP '245") in view of Nakagawa et al. (US 2003/0064282) should be reversed.

A. The Examiner's Position

For the Board's convenience, the Examiner's positions, as set forth on pages 3-4 of the Office Action dated June 24, 2009, is reproduced below.

Regarding claims 1 and 13, Yuji discloses a lithium ion secondary battery, which uses a solid polymer electrolyte (abstract, page 6) and a liquid crosslinkable composition for the solid electrolyte (0001). The liquid crosslinkable composition for the solid electrolytes of Yuji et al. comprises radically polymerizable monomers of oxetane ring containing monomer and epoxy group containing monomer (0011). Moreover Yuji teaches a battery separator (0004). Additionally, Yuji teaches that the liquid crosslinkable composition containing oxetane group and epoxy group is injected into the airtight container, which has units such as electrodes and separator (0020). The liquid composition infiltrates into gaps such as electrode and a separator (0020).

With respect to claim 1, it is noted that the reference of Yuji discloses same crosslinking polymer containing cation-polymerizable functional group selected from the group consisting of 3-octanyl group and epoxy as claimed by applicant. The difference between the invention of Yuji and the presently claimed invention is that Yuji does not explicitly teach "a crosslinking polymer layer formed on the porous film substrate so as to be in contact with the porous film substrate consisting of a crosslinking polymer layer... cation." as claimed. Specifically, Yuji does not teach coating of the aforementioned crosslinking polymer onto a porous film substrate. Instead, Yuji discloses injecting aforementioned crosslinking polymer along with cationic initiator, electrolyte solvent and lithium electrolyte salt into the airtight container (i.e. battery), which has units such as electrodes and battery separator (see claim 19).

However, Nakagawa teaches that as a method for inhibiting liquid electrolyte leakage there is known a method, which comprises incorporating a crosslinkable monomer in a liquid electrolyte, subjecting the liquid electrolyte to crosslinking reaction to produce a jelly solidified gel electrolyte, and then using the solid electrolyte comprising a solidified liquid electrolyte singly or in combination with a substrate as a separator (0004). According to Nakagawa such method has disadvantage because in the case of such a gel electrolyte, ions move through the gel at a very low rate than in the liquid electrolyte, easily causing an increase of internal resistivity of battery and drop of high rate discharge capacity. The resulting battery shows insufficient battery properties (0005). To overcome these disadvantages Nakagawa teaches a separator for battery prepared by

impregnating or coating a porous material (porous film/membrane) with a monomer solution comprising crosslinkable monomer (0071).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the porous film of Nakagawa as a battery separator in the invention of Yuji and form a crosslinking polymer layer of Yuji on the porous film as taught by Nakagawa, motivated by the desire to avoid increase of internal resistivity of a battery and drop of high rate discharge capacity.

B. Appellants' Response

A *prima facie* showing of obviousness requires (1) a suggestion or motivation in the references or in the knowledge of one of ordinary skill in the art, to modify the references or to combine reference teachings; (2) a reasonable expectation of success; and (3) a teaching or suggestion of all claimed limitations.

The U.S. Supreme Court has recently clarified the standards applicable to obviousness.

See generally KSR Int'l Co. v. Teleflex Inc., 550 U.S. at ___, 82 USPQ2d at 1396 (2007). As reiterated in *KSR*, "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR*, 550 U.S. at 82 USPQ2d at 1396. Instead, the key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. Thus, after *KSR*, "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id.* at 1396. *KSR* also reiterated that an evaluation for obviousness cannot be based on hindsight. *Id.* at 1397; MPEP §2142 states that "impermissible hindsight must be avoided and the legal conclusion [of obviousness] must be reached on the basis of the facts gleaned from the prior art."

For the Board's convenience, claim 1 is set forth below.

1. A crosslinking polymer-supported porous film for battery separator, the crosslinking polymer-supported porous film comprising: a porous film substrate; and a crosslinking polymer layer formed on the porous film substrate so as to be in contact with the porous film substrate consisting of a crosslinking polymer having plural cation-polymerizable functional groups and being polymerizable in the presence of cation. The claimed porous film is a layer of the crosslinking polymer.

It is respectfully submitted that there is no motivation to modify JP '245 as proposed by the Examiner, based on Nakagawa, to arrive at the claimed invention.

JP '245 is directed to a polymer solid-type electrolyte lithium ion secondary battery. By formation of a polymer solid, gelling of the system takes place, which solves the problems of using a liquid electrolyte. *See [0008]*. Specifically, by crosslinking an oxetane ring containing polymer in the presence of a cationic initiator in the liquid electrolyte, good gelling was formed, and the problem of the electrolyte from dissociating from the gel (bleeding) was solved. In addition, the liquid electrolyte contains a *crosslinkable* oxetane ring containing *polymer*.

Nakagawa discloses that a *crosslinked* material layer is formed on a porous material (separator). *See e.g., [0024]-[0025] and [0042]*. Specifically, Nakagawa discloses that the *crosslinked* layer is formed from at least one monomer having an unsaturated bond, monomer having an epoxy group, or a monomer having an isocyanates group. *See [0025]*. Nakagawa further discloses that the separator can be prepared by coating the porous material with a monomer solution comprising the crosslinkable monomer. *See [0071]*. Indeed, in the Examples, e.g., Example 1, a monomer solution is applied to a microporous polyethylene membrane as a porous material and irradiated so that the monomer was *crosslinked* to form a *crosslinked* material layer.

It is submitted that if JP '245 were modified as proposed by the Examiner, the result would be a "crosslinked" layer as opposed to a "crosslinking" layer as recited in claim 1, since Nakagawa teaches the use of a "crosslinked" layer.

In this regard, the Examiner asserts that "before the polymer is crosslinked it is clearly a crosslinking polymer." However, Nakagawa teaches that a crosslinkable monomer solution is coated on the porous material. Thus, prior to crosslinking, the layer is a crosslinkable monomer, not a crosslinkable polymer, as recited in claim 1. The Examiner has accepted this distinction as \ the §102 rejection over Nakagawa was withdrawn. *See* Office Action dated April 30, 2008.

In addition, the "benefits" of using the method of Nakagawa is based on the "crosslinked" material layer formed on the porous material. That is, Nakagawa discloses that in order to overcome the disadvantages of the prior art, a separator for a battery comprising a crosslinked material layer formed on a porous material having a gas permeability. *See* [0009]-[0012]. Based on such teaching in Nakagawa, one of ordinary skill in the art would not be motivated to form a crosslinkable polymer layer.

For the above reasons, it is respectfully submitted that, even if there were some motivation to combine the references, one of ordinary skill in the art would not arrive at the claimed invention.

Furthermore, JP '245 teaches that the oxetane ring containing polymer is crosslinked to form a crosslinked material (gel). Specifically, JP '245 discloses that a solidification of electrolyte is necessary in order to avoid danger, such as a leaking of electrolyte, explosion, and ignition. *See* page 16, [0002]. Additionally, in JP '245, it is preferable that there is no bleeding

of the electrolyte from the gel. *See page 21, [0008].* Thus, the liquid electrolyte of JP '245 exists in a state that it is caught by the crosslinked material layer (gel). JP '245 further discloses that the bleeding of the electrolyte is not preferable in Table 2. *See page 39-41, [0029].*

Accordingly, if JP '245 were modified to have an uncrosslinked material, it is submitted that JP '245 would be rendered inoperable for its intended purpose. *See MPEP §2143.01.V.* ("If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)").

For at least the above reasons, it is respectfully submitted that a *prima facie* case of obviousness has not been established.

Conclusion

In view of the above, it is respectfully submitted that claim 1 is patentable over the cited art.

In addition, claims 2-7 and 9 depend from claim 1, and thus it is respectfully submitted that these claims are patentable for at least the same reasons as claim 1.

Accordingly, it is respectfully submitted that the obviousness rejection should be reversed.

**APPEAL BRIEF
U.S. Application No.: 10/724,882**

Attorney Docket No.: Q78640

The USPTO is directed and authorized to charge the statutory fee (37 C.F.R. §41.37(a) and 1.17(c)) and all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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CLAIMS APPENDIX

CLAIMS 1-7 and 9 ON APPEAL:

1. A crosslinking polymer-supported porous film for battery separator, the crosslinking polymer-supported porous film comprising:

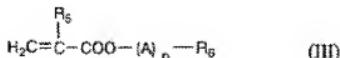
a porous film substrate; and

a crosslinking polymer layer formed on the porous film substrate so as to be in contact with the porous film substrate consisting of a crosslinking polymer having plural cation-polymerizable functional groups and being polymerizable in the presence of cation.

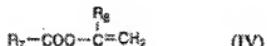
2. The crosslinking polymer-supported porous film as claimed in claim 1, wherein the crosslinking polymer has a plurality of at least one cation-polymerizable functional group selected from the group consisting of 3-oxetanyl group and epoxy group.

3. The crosslinking polymer-supported porous film as claimed in claim 1, wherein the crosslinking polymer is a radical copolymer comprising at least one radical-polymerizable monomer selected from the group consisting of a radical-polymerizable monomer having 3-oxetanyl group and a radical-polymerizable monomer having epoxy group, and other radical-polymerizable monomer,

wherein the other radical-polymerizable monomer is at least one monomer selected from the group consisting of (meth)acrylate represented by the following formula (III):



wherein R₅ represents hydrogen atom or methyl group; A represents an oxyalkylene group having 2 or 3 carbon atoms; R₆ represents an alkyl group having 1-6 carbon atoms or a fluorinated alkyl group having 1-6 carbon atoms; and n is an integer of 0-3, and vinyl ester represented by the following formula (IV):



wherein R₇ represents methyl group or ethyl group; and R₈ represents hydrogen atom or methyl group.

4. The crosslinking polymer-supported porous film as claimed in claim 3, wherein the crosslinking polymer is a radical copolymer comprising 5-50% by weight of a radical-polymerizable monomer having 3-oxtanyl group and other radical-polymerizable monomer.

5. The crosslinking polymer-supported porous film as claimed in claim 3, wherein the crosslinking polymer is a radical copolymer comprising 5-50% by weight of a radical-polymerizable monomer having epoxy group and other radical-polymerizable monomer.

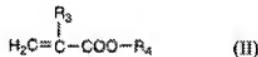
6. The crosslinking polymer-supported porous film as claimed in claim 3, wherein the radical-polymerizable monomer having 3-oxtanyl group is 3-oxtanyl group-containing

(meth)acrylate represented by the following formula (I):



wherein R_1 represents hydrogen atom or methyl group; and R_2 represents hydrogen atom or an alkyl group having 1-6 carbon atoms.

7. The crosslinking polymer-supported porous film as claimed in claim 3, wherein the radical-polymerizable monomer having epoxy group is epoxy group-containing (meth)acrylate represented by the following formula (II):



wherein R_3 represents hydrogen atom or methyl group; and R_4 represents an epoxy group-containing group represented by the following formula (1) or (2):



9. The crosslinking polymer-supported porous film as claimed in claim 1, wherein the porous film substrate has a thickness of 3-50 μm and a porosity of 20-95 %.

EVIDENCE APPENDIX:

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), submitted herewith are copies of any evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the appeal.

None.

RELATED PROCEEDINGS APPENDIX

Submitted herewith are copies of decisions rendered by a court or the Board in any proceeding identified about in Section II pursuant to 37 C.F.R. § 41.37(c)(1)(ii).

None.